US006739920B2

(12) **United States Patent**
Fujii et al.

(10) **Patent No.: US 6,739,920 B2**
(45) **Date of Patent: May 25, 2004**

(54) **JOINT CONNECTOR**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/223,758**

(22) Filed: **Aug. 19, 2002**

(65) **Prior Publication Data**

US 2003/0040224 A1 Feb. 27, 2003

(30) **Foreign Application Priority Data**

Aug. 21, 2001 (JP) 2001-250021

(51) **Int. Cl.**[7] **H01R 11/09**
(52) **U.S. Cl.** **439/723**
(58) **Field of Search** 439/723, 721, 439/72.1, 212, 949

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(57) **ABSTRACT**

A joint connector (**40**) is composed of a joint terminal (**50**) and a relay housing (**41**). A first housing (**10**) and a second housing (**20**) are mounted on an electric part-side connector connection portion (**42**) of the relay housing (**41**). A power-source side housing (**30**) is mounted on a power-source side connector connection portion (**46**). Terminal fittings are short-circuited with the joint terminal (**50**). The first housing (**10**) and the second housing (**20**) share the power-source side housing (**30**) and the joint connector (**40**).

5 Claims, 13 Drawing Sheets

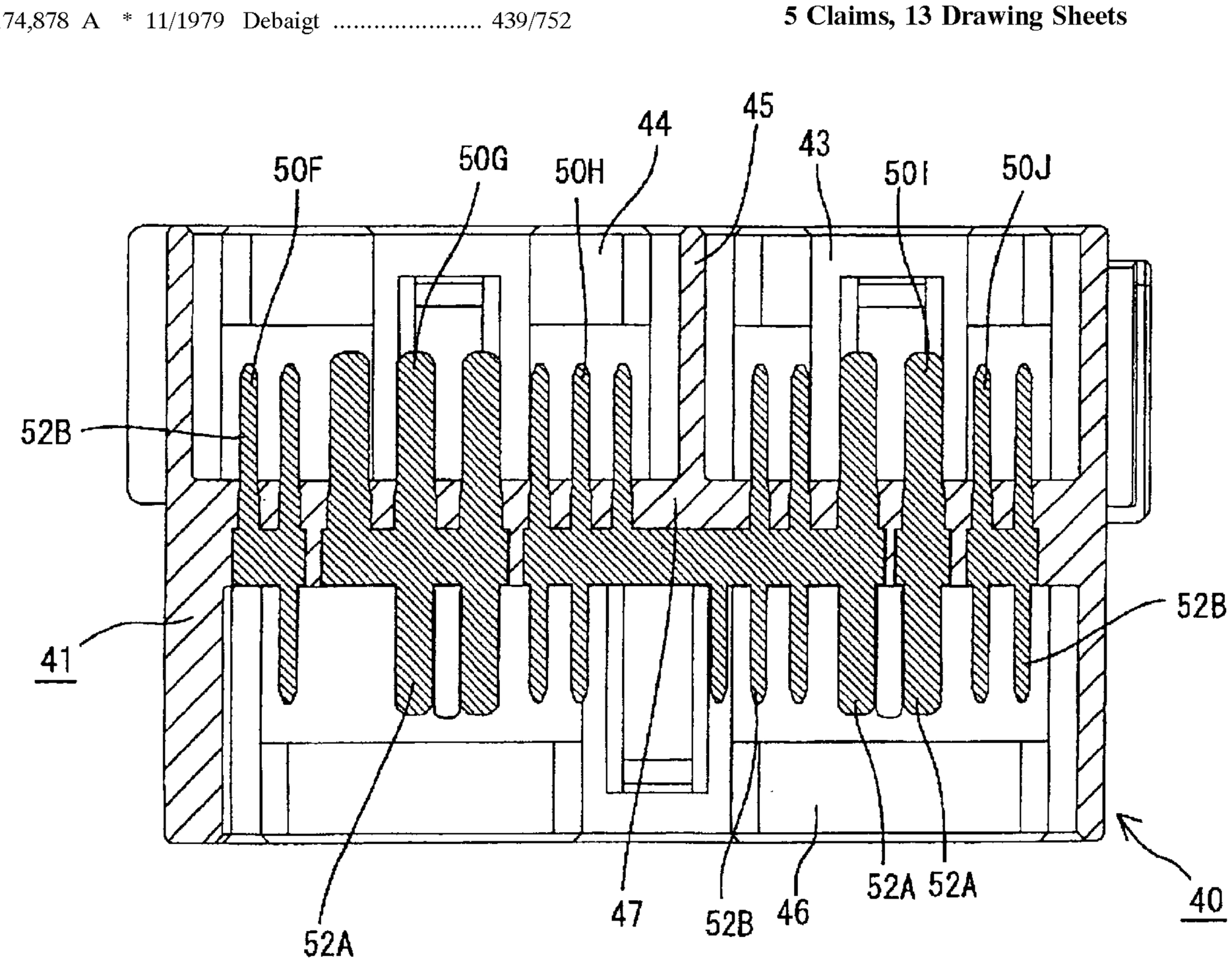


FIG. 1

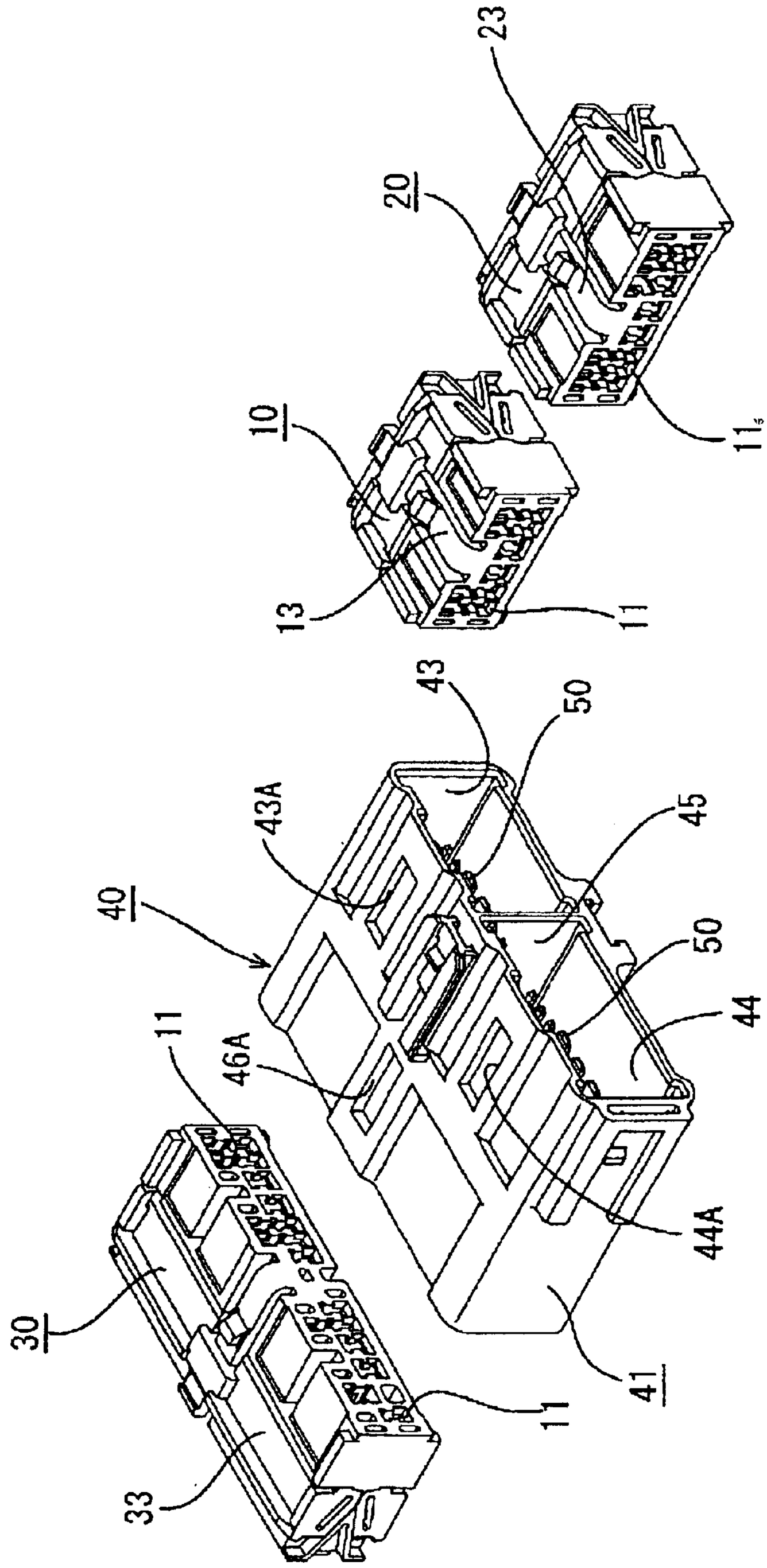


FIG. 2

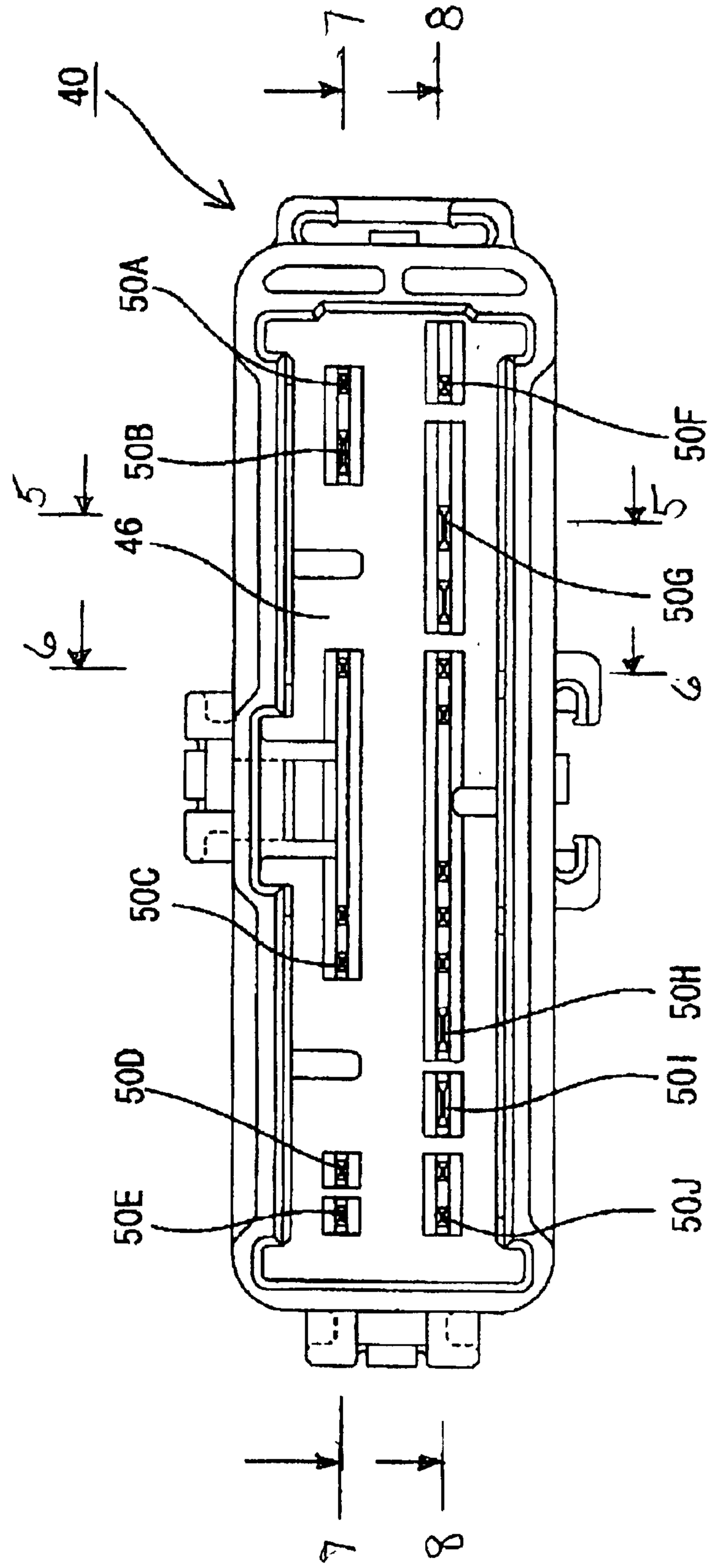


FIG. 3

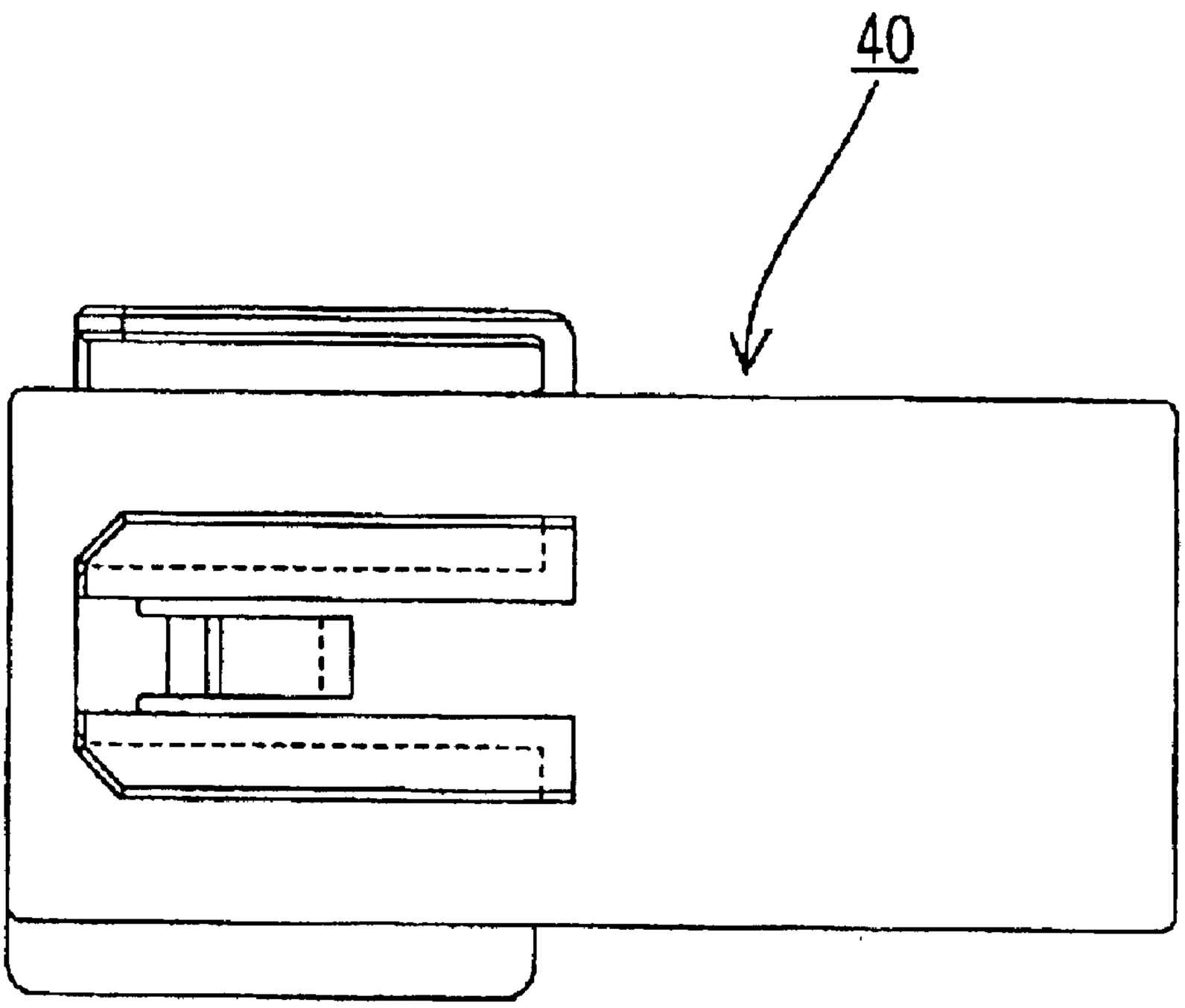


FIG. 4

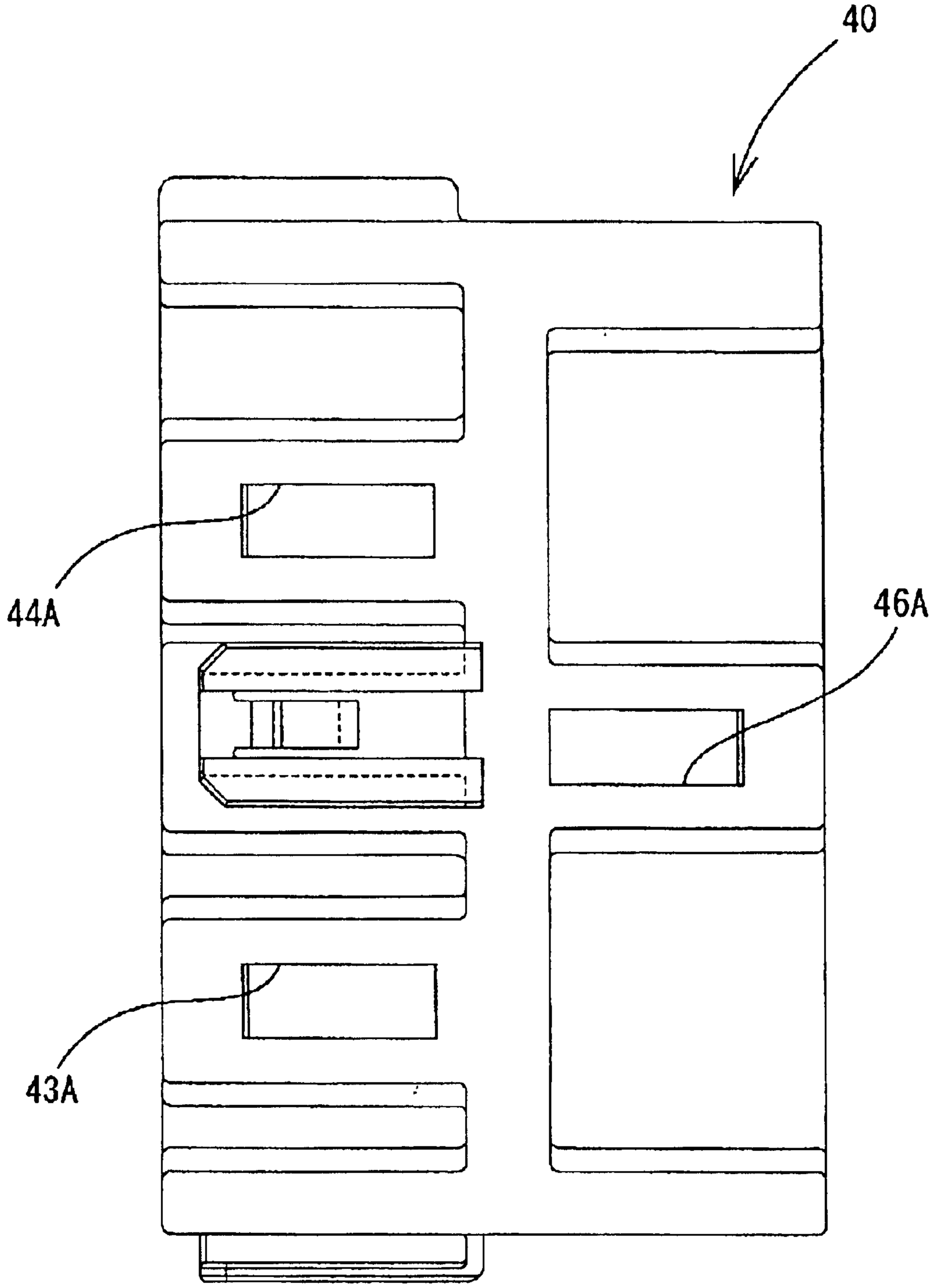


FIG. 5

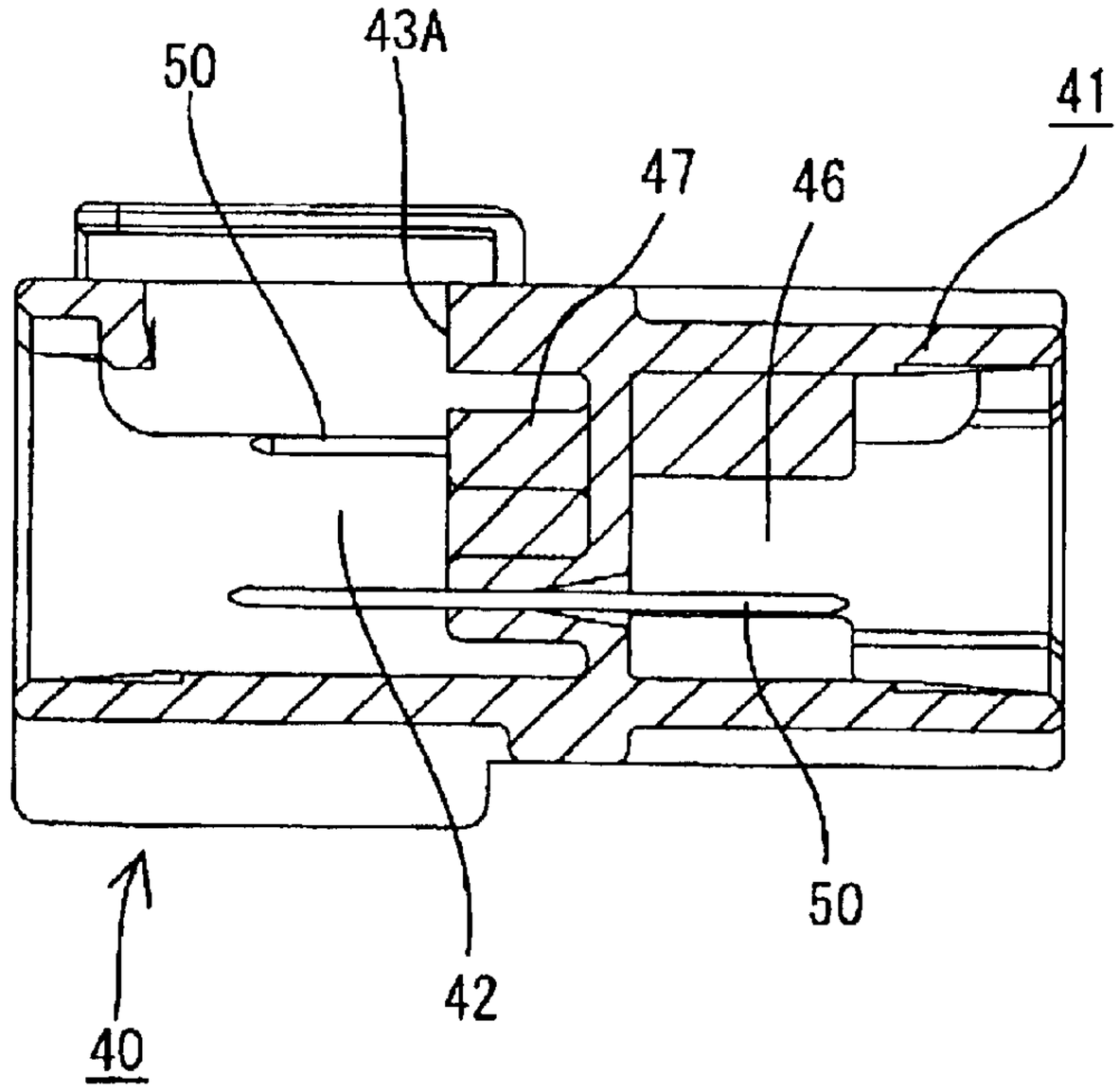


FIG. 6

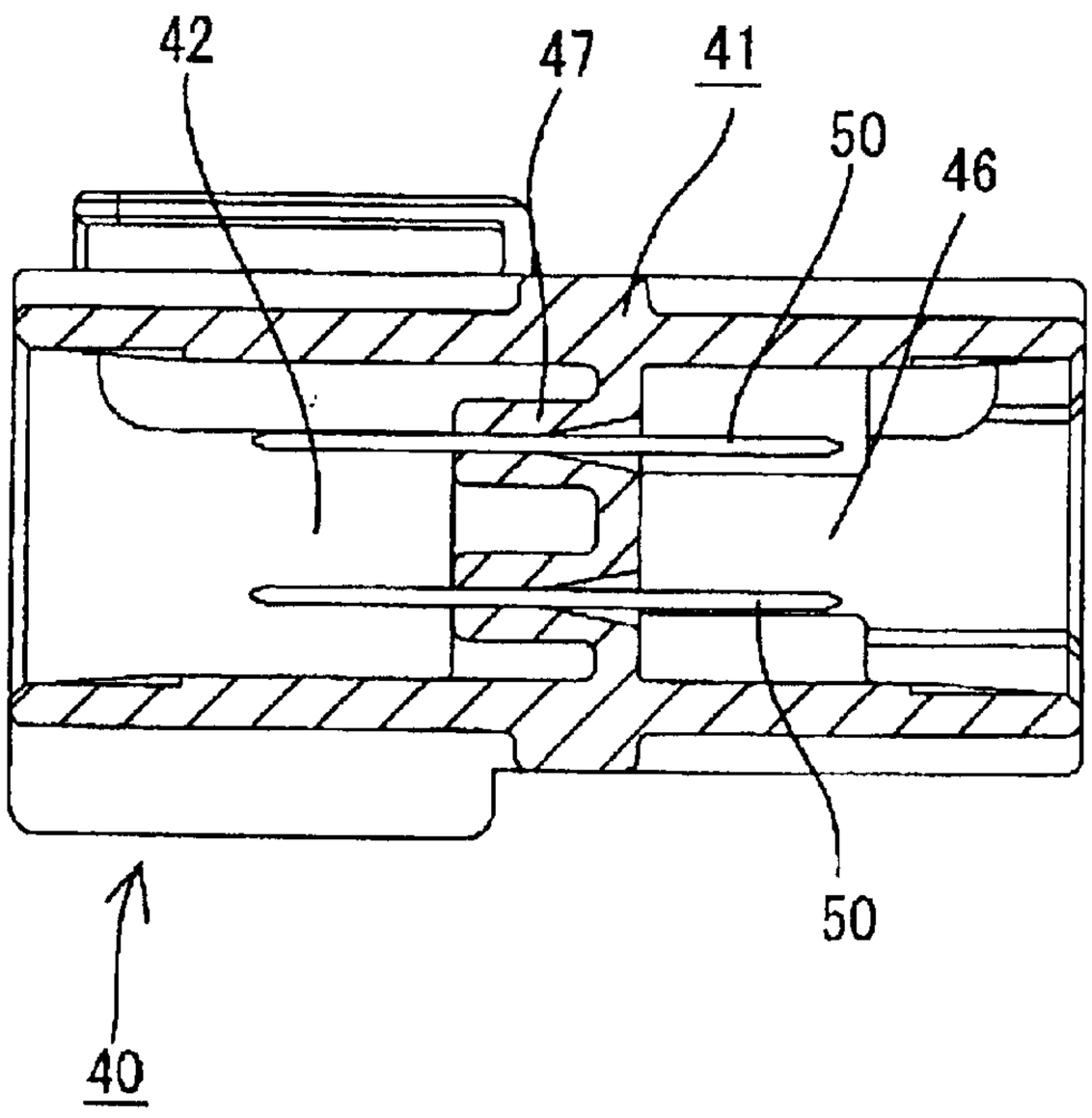


FIG. 7

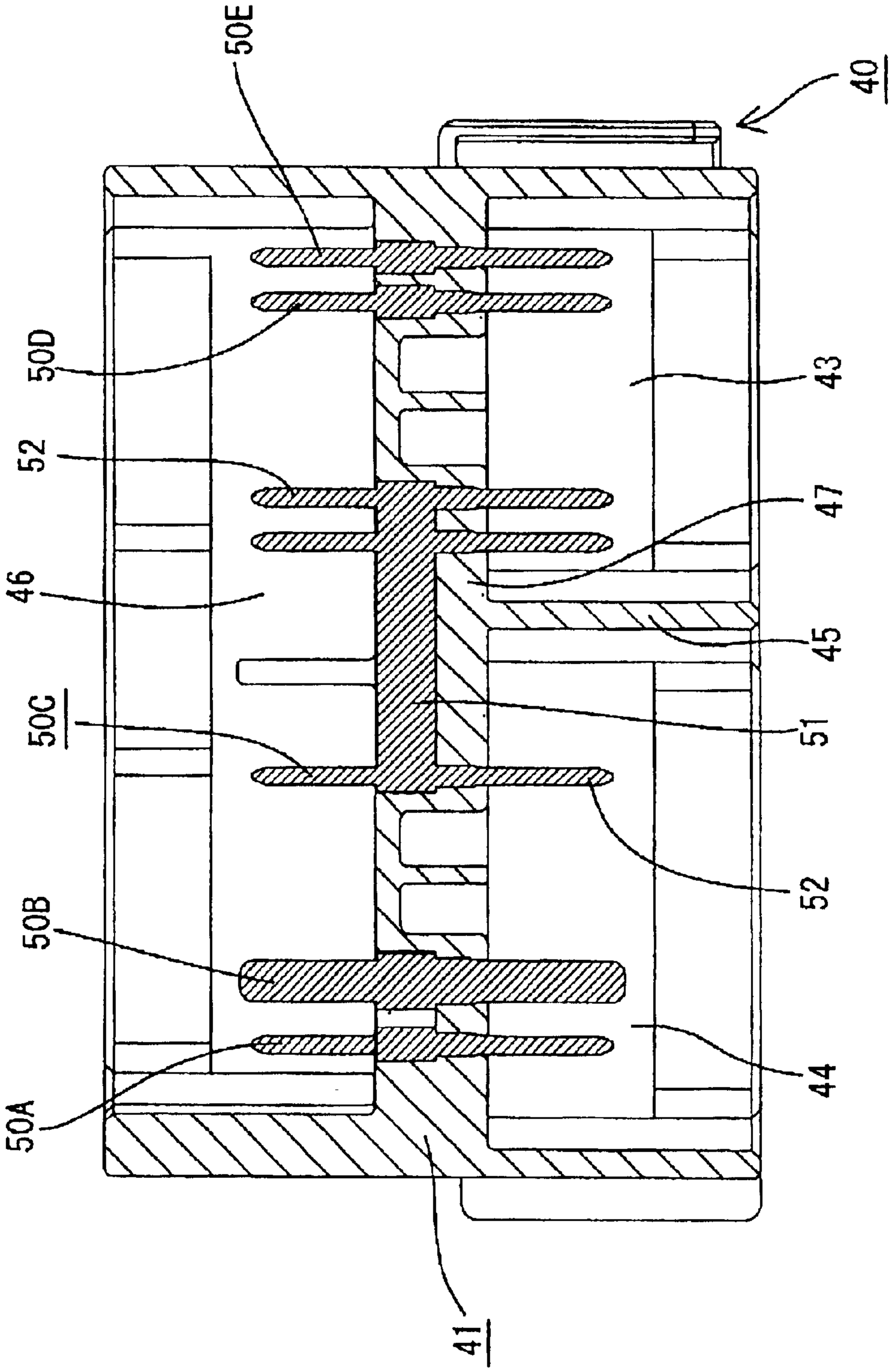


FIG. 8

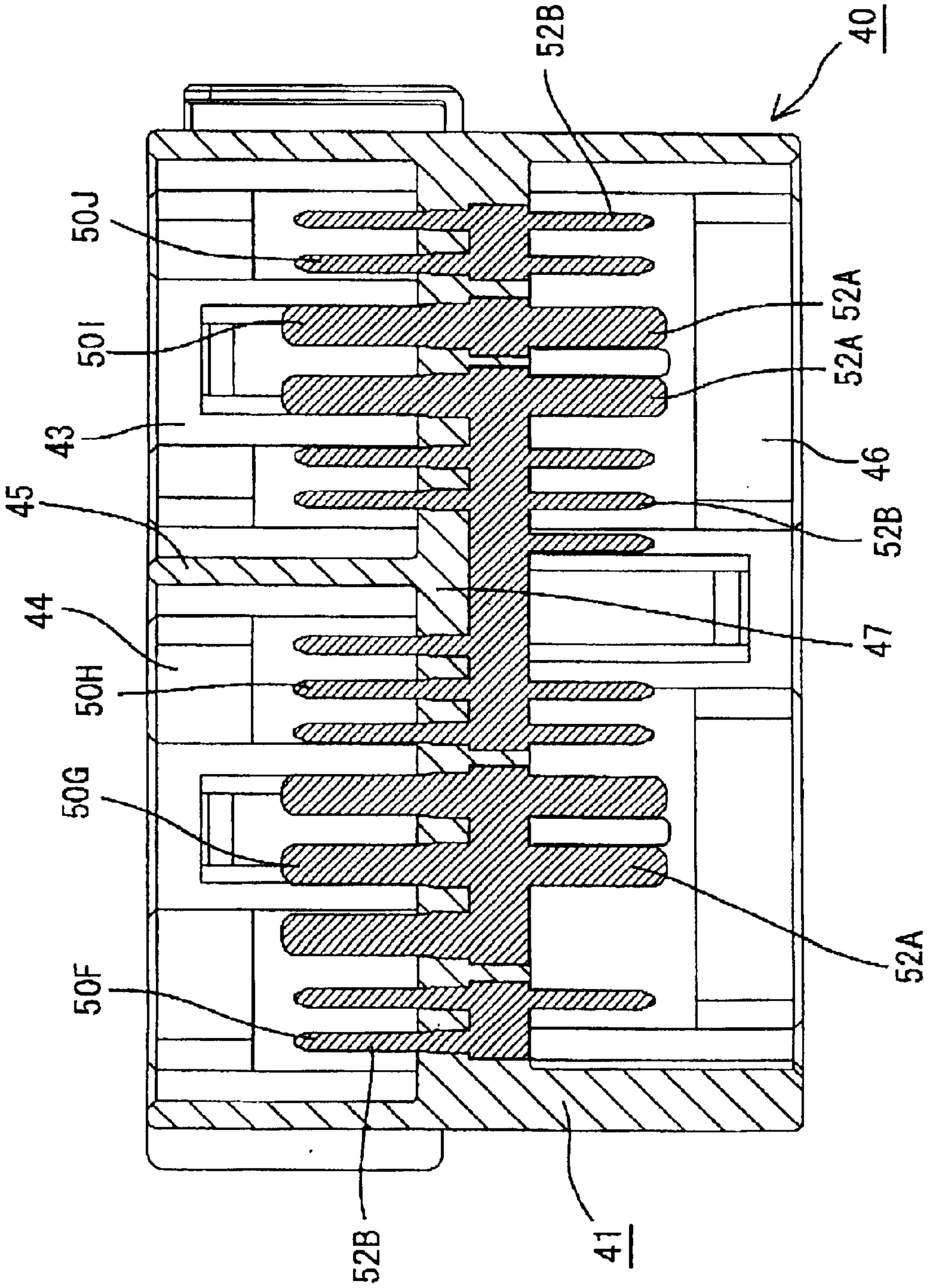


FIG. 9

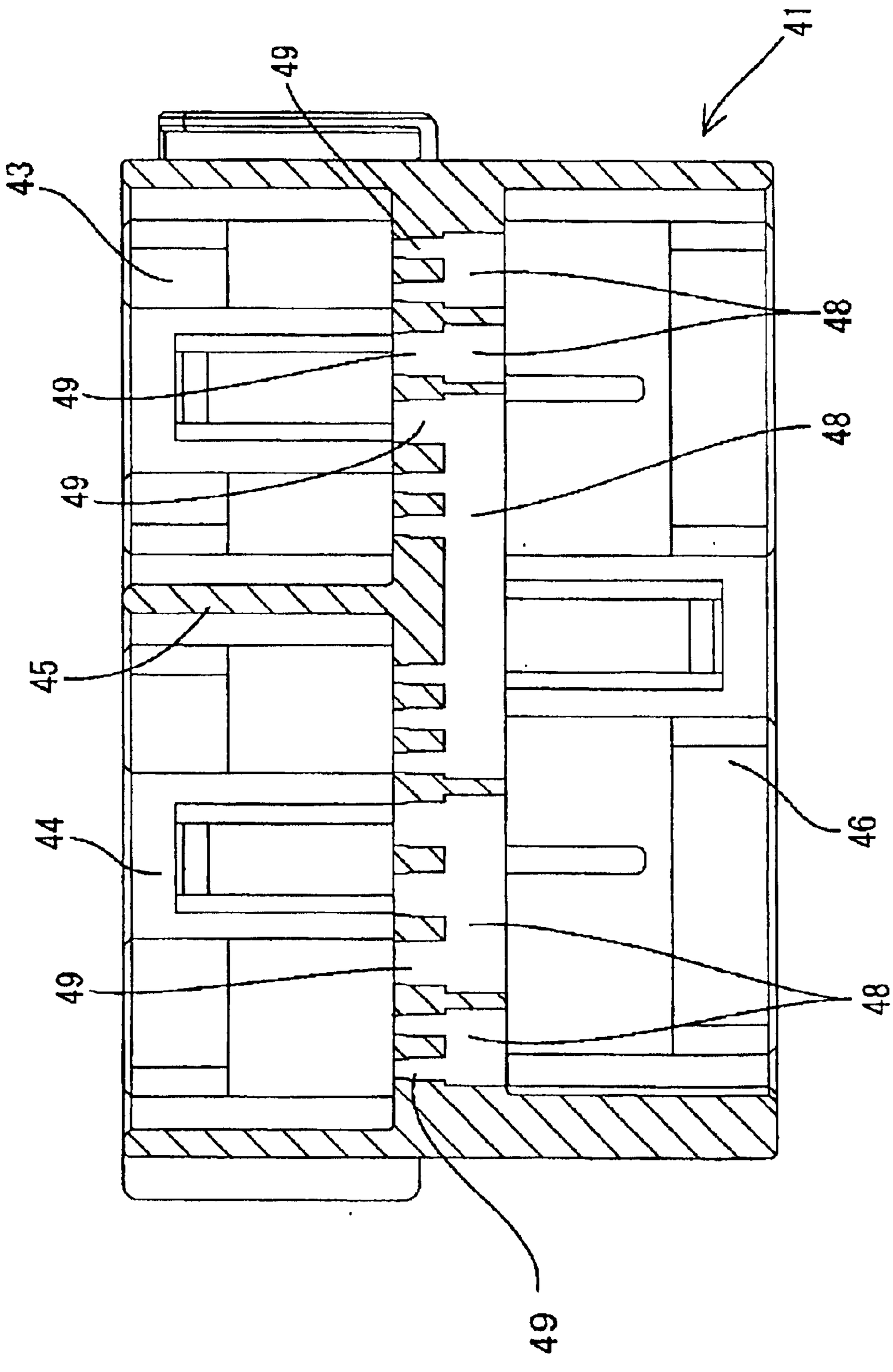


FIG. 10

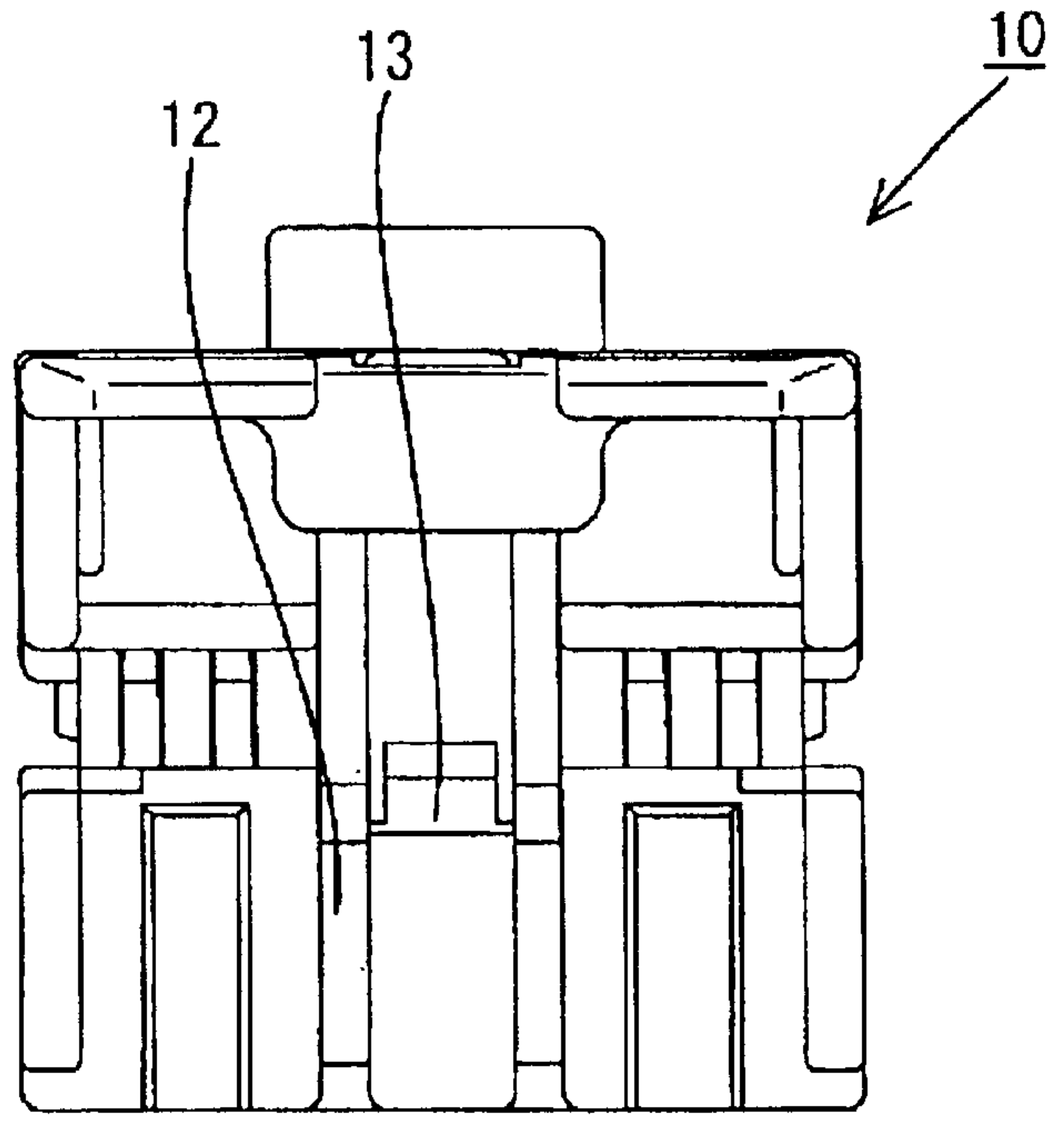


FIG. 11

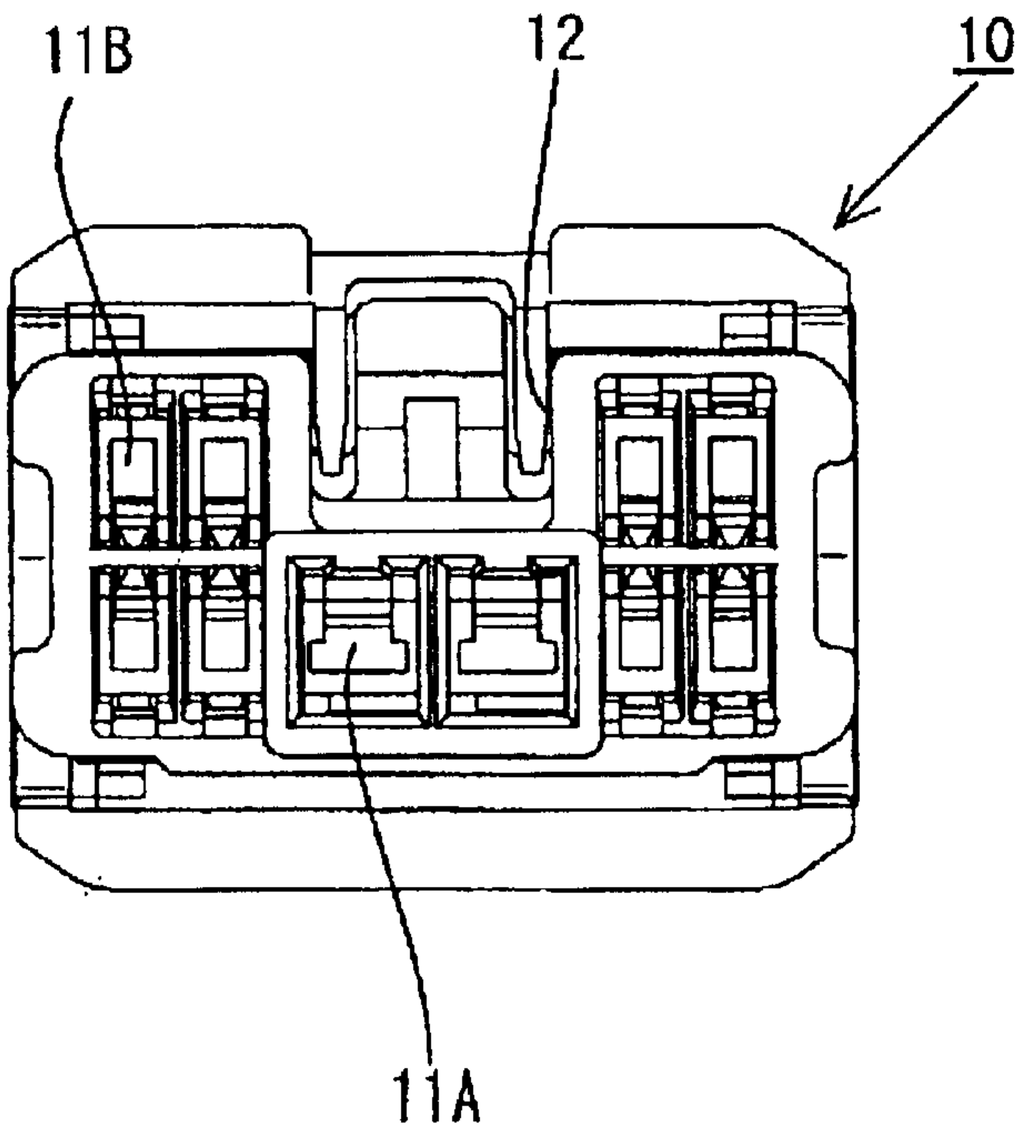


FIG. 12

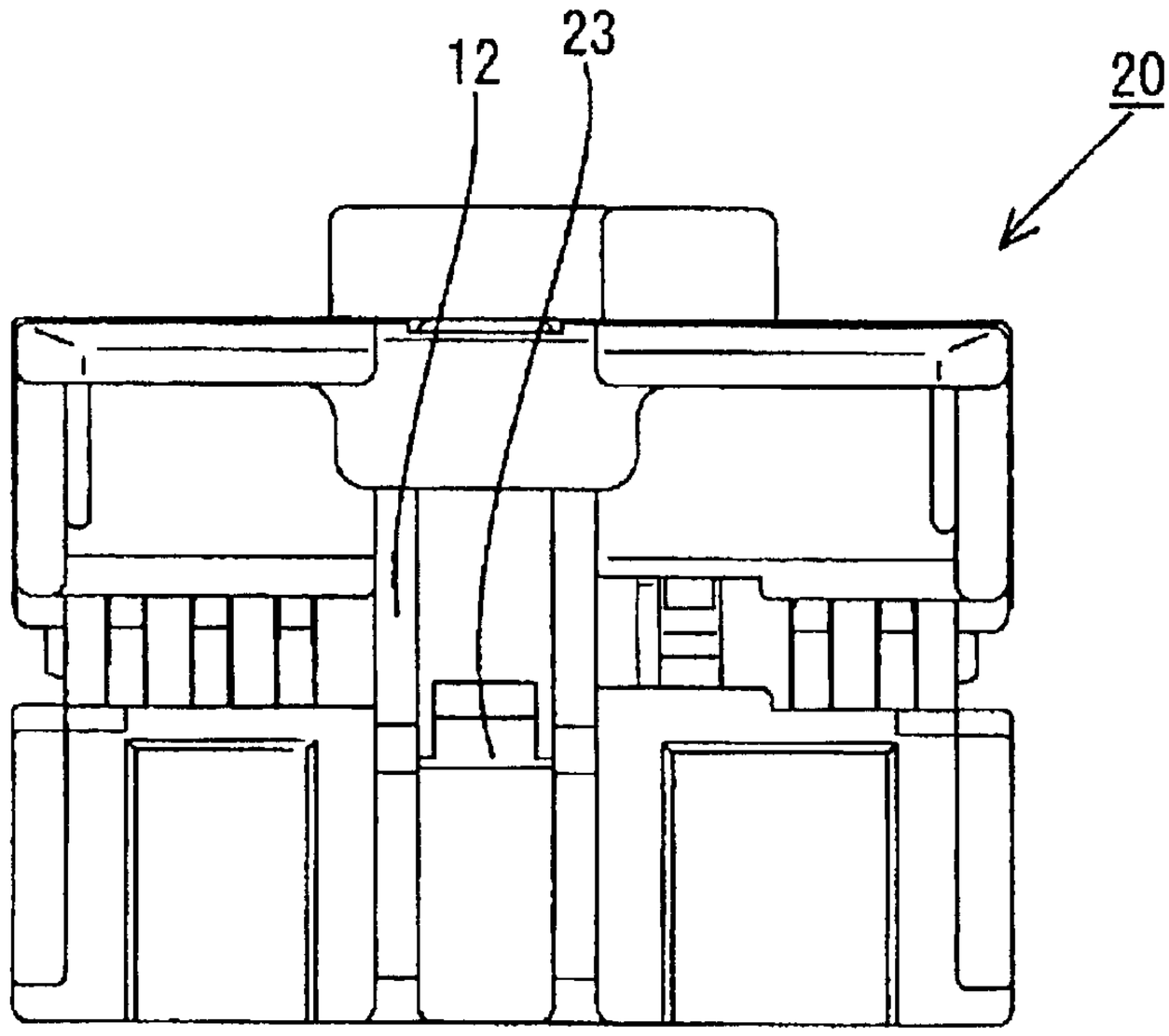
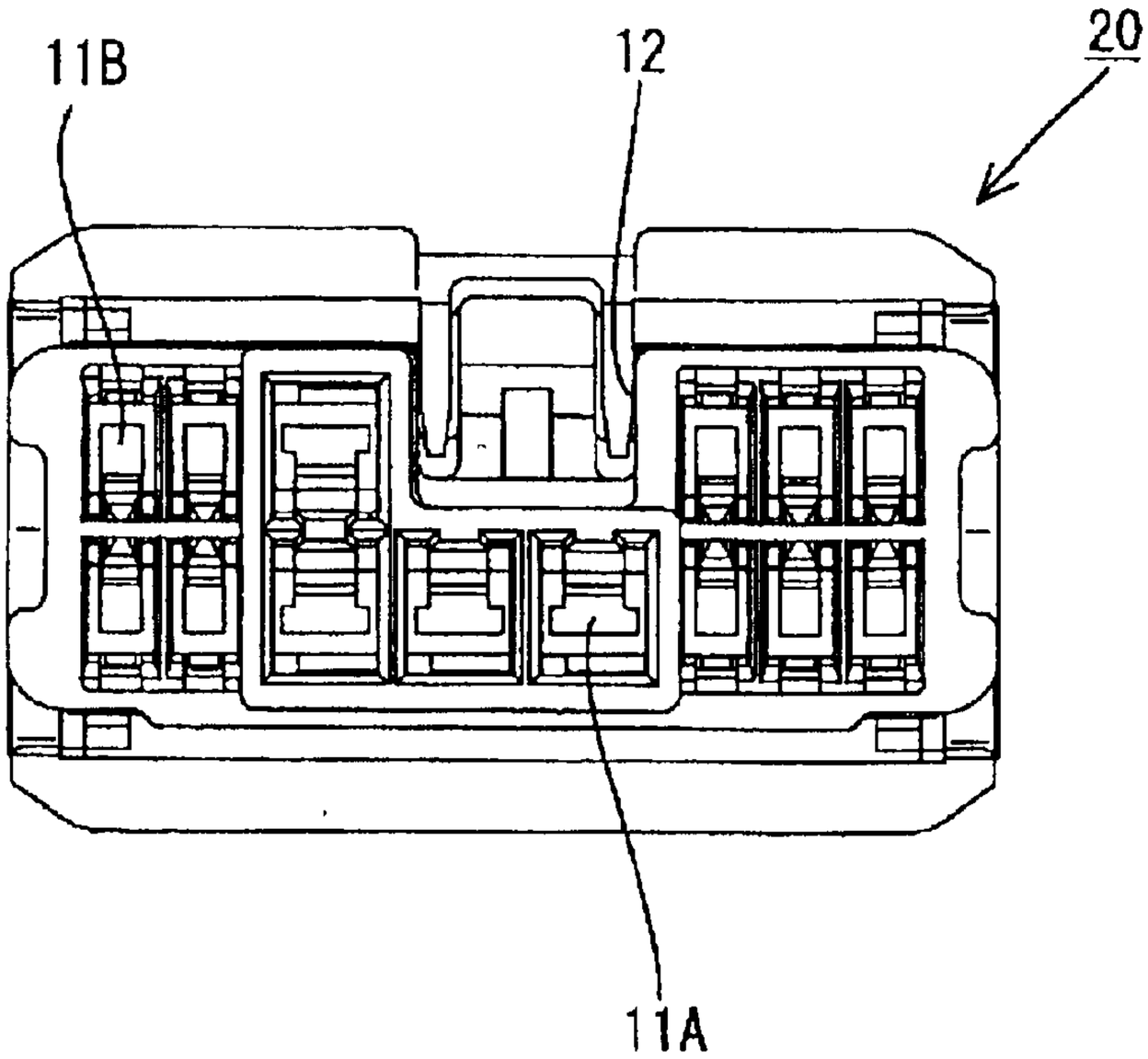


FIG. 13



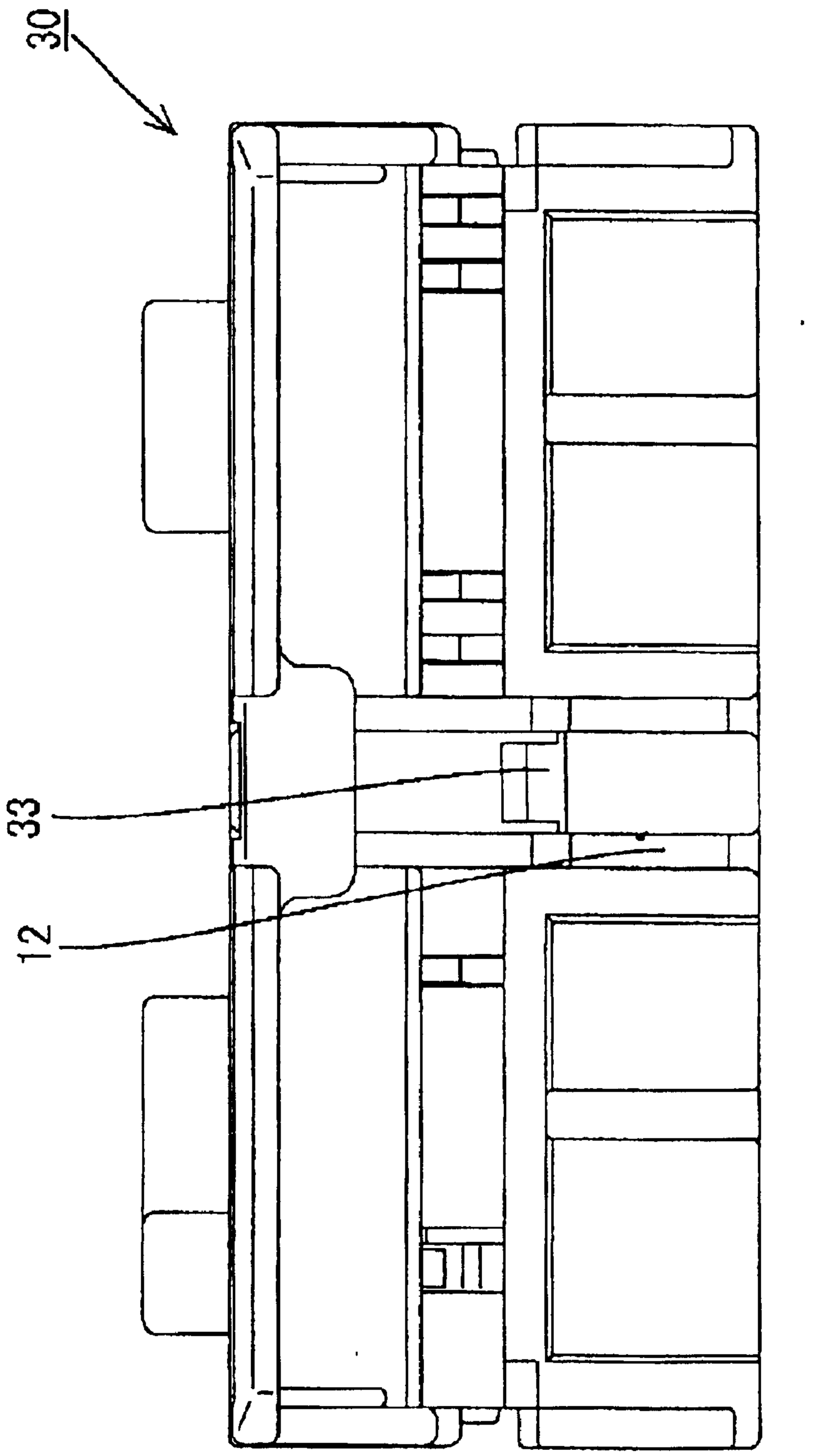


FIG. 14

FIG. 15

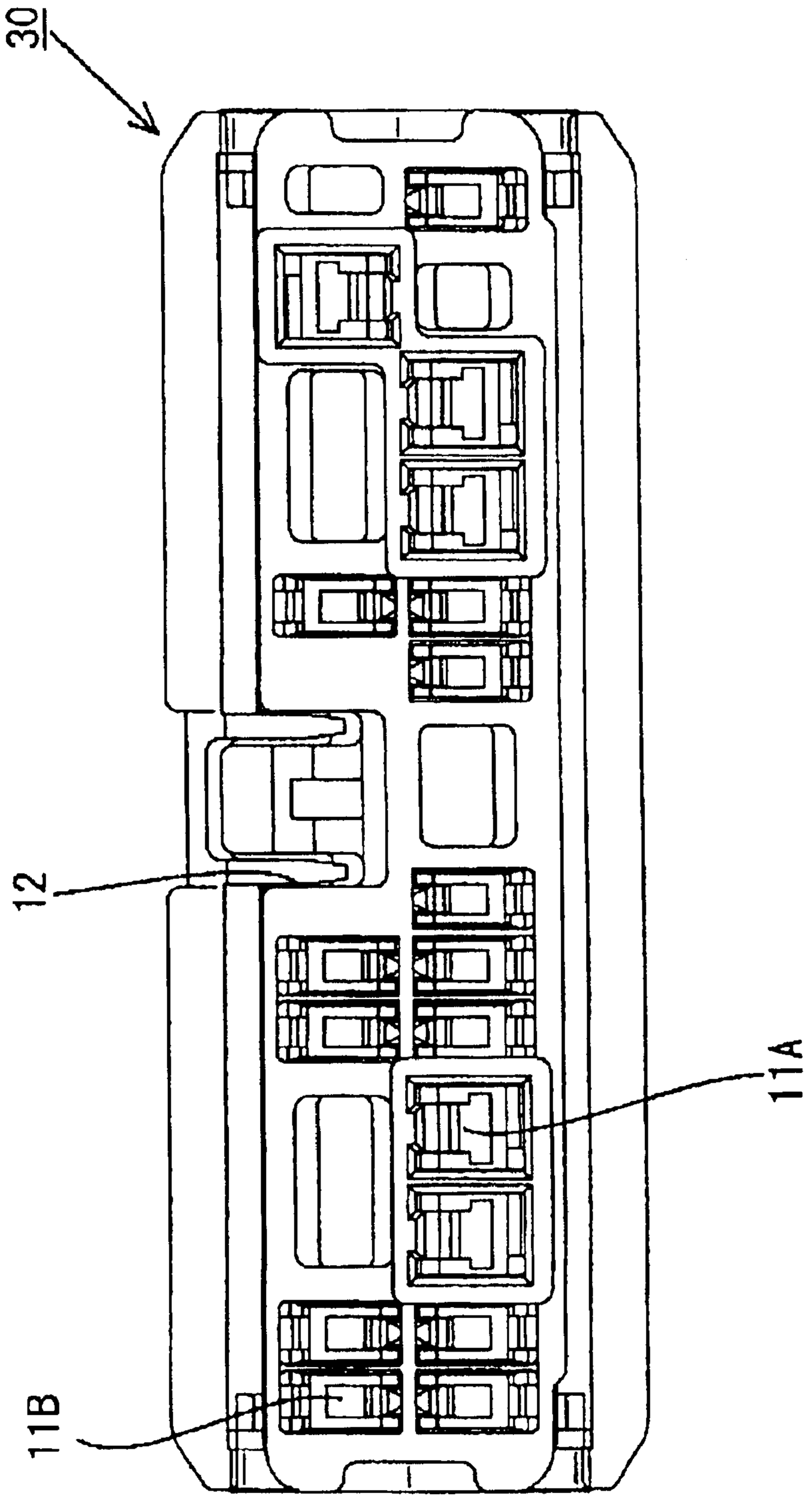
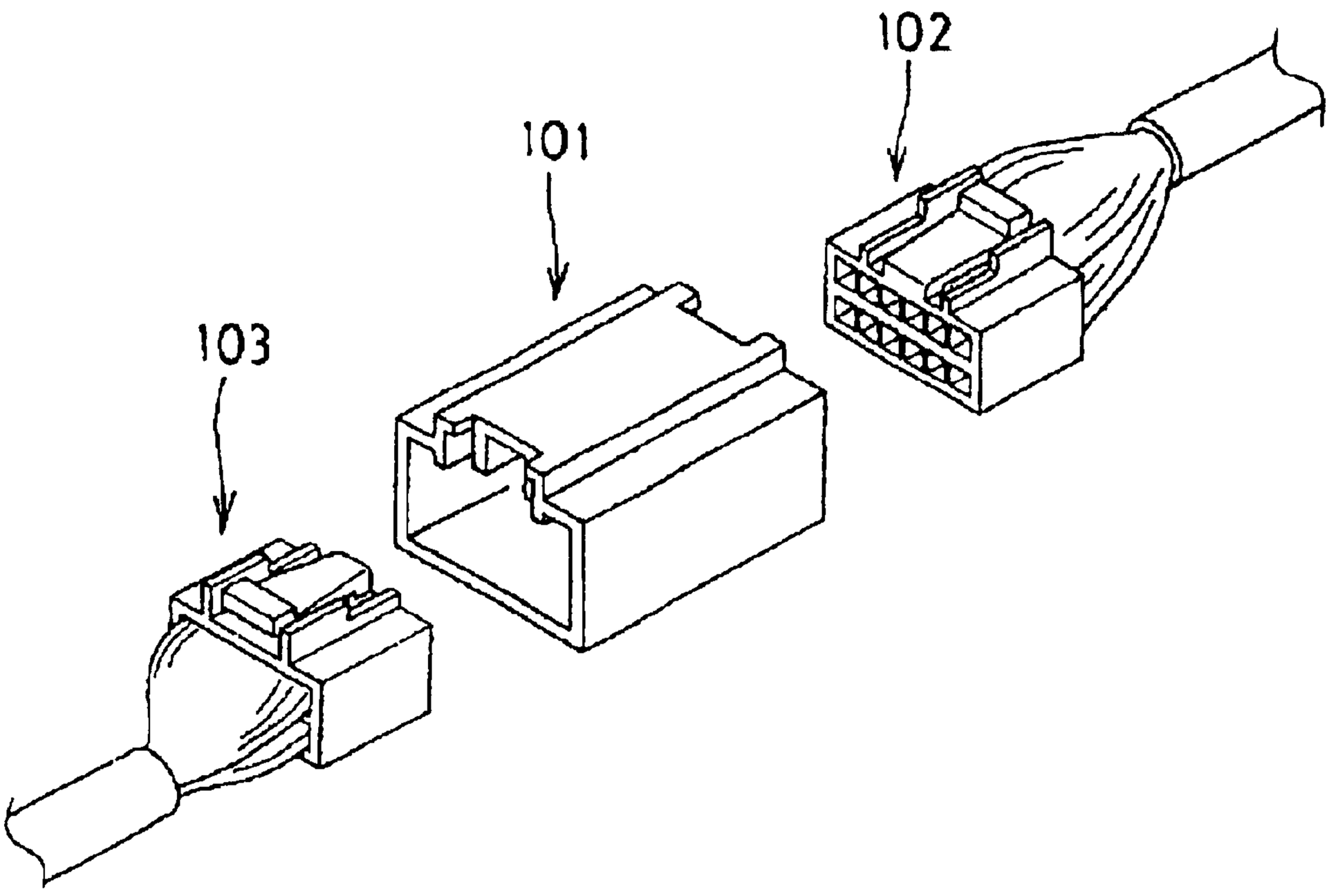


FIG. 16



JOINT CONNECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a joint connector.

2. Description of the Related Art

Electric power is supplied to electric parts from a power-supply, such as a battery. More particularly, a first harness is connected to the power supply and a second harness is connected to the electric-parts. The harnesses then are relayed with a joint connector. FIG. **16** shows the joint connector disclosed in U.S. Pat. No. 5,645,455. This joint connector **101** is used with an electric part housing **102** mounted on an end of a harness at the electric-part side and a power-source housing **103** mounted on an end of a harness at the power side. The electric part housing **102** and the electric source housing **103** are fit on each other in a one-to-one correspondence.

An increase of the number of the electric-part side harnesses causes an increase in the number of the joint connectors **101**, power-source side housings **103**, and harnesses to be relayed. That is, as the number of the electric part housings **102** increases, the electric part housings **102** and the power-source side housings **103** keep one-to-one correspondence. In this joint connector, since one system is composed of three component parts, two systems are composed of six component parts. This is a problem to be solved.

The present invention has been made in view of the above-described situation. Accordingly, it is an object of the present invention to provide a joint connector that allows a reduction in the number of component parts in relaying a plurality of systems.

SUMMARY OF THE INVENTION

The invention is directed to a joint connector with a relay housing that accommodates joint terminals. The joint connector connects a first-side connector that is connected to at least one harness to a plurality of second-side connectors that are connected to a plurality of harnesses. Thus, the second-side connectors share the first-side connector, and a branch connection between the first-side connector and the second-side connectors is made through the joint terminals.

The relay housing preferably has a first and second connection portions. The first connection portion is connected to the first-side connector. The second connection portion is partitioned by at least one partitioning wall into plural parts that are connected respectively to the second-side connectors. The joint terminals preferably are installed on the relay housing in a direction from the first connection portion, and the joint terminals stride over the partitioning wall to make a branch connection between the second-side connectors that are adjacent to each other. Thus the partitioning wall is interposed between the second-side connectors.

The second-side connectors share the first-side connector. Therefore it is possible to make the number of component parts smaller than the conventional art in which the first-side connector and the second-side side connector fit on each other in a one-to-one relationship.

The joint terminal is installed on the relay housing in the direction from the first-side connector connection portion. Thus, it is possible to mount the joint terminal on the relay housing after the relay housing is molded, with the joint terminal striding over the partitioning wall.

Therefore it is possible to accomplish a branch connection of the second-side housings adjacent to each other, with the partitioning wall interposed therebetween.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded perspective view showing connectors relaying a harness in one embodiment of the present invention.

FIG. **2** is a front view showing a joint connector.

FIG. **3** is a right side view of the joint connector.

FIG. **4** is a top plan view of the joint connector.

FIG. **5** is a sectional view taken along a line **5**—**5** of FIG. **2**.

FIG. **6** is a sectional view taken along a line **6**—**6** of FIG. **2**.

FIG. **7** is a sectional view taken along a line **7**—**7** of FIG. **2**.

FIG. **8** is a sectional view taken along a line **8**—**8** of FIG. **2**.

FIG. **9** is a horizontal sectional view showing a relay housing.

FIG. **10** is a top plan view showing a first housing.

FIG. **11** is a rear view showing the first housing.

FIG. **12** is a plan view showing a second housing.

FIG. **13** is a rear view showing the second housing.

FIG. **14** is a plan view showing a power-source side housing.

FIG. **15** is a rear view showing the power-source side housing.

FIG. **16** is an exploded perspective view showing a conventional joint connector.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A first electric-part side female housing **10** and a second electric-part side female housing **20** are illustrated in FIG. **1**. The first and second housings **10**, **20** are connected to terminals of harnesses that are connected respectively to at least one unillustrated electric part. The first housing **10** is formed with a resiliently deflectable lock arm **13**. Similarly, the second housing **20** is formed with a resiliently deflectable lock arm **23**. A power-source side female connector housing **30** is connected to terminals of a harness connected to an unillustrated power source and is formed with a resiliently deflectable lock arm **33**.

The first and second housings **10**, **20** are relayed to the power-source side housing **30** with a joint connector **40**. The joint connector **40** includes a relay housing **41** and joint terminals **50**.

The relay housing **41** is made of resin, and is in the form of a longitudinally open rectangular pillar. As shown in FIGS. **5** and **6**, a separation wall **47** extends parallel to the ends and partitions the inside of the relay housing **41** into an electric-part side connector connection portion **42** and a power-source side connector connection portion **46**.

As shown in FIGS. **7** and **8**, a partitioning wall **45** is formed in the electric part-side connector connection portion **42** to partition the electric part-side connector connection portion **42** into a right accommodation chamber **43** and a left accommodation chamber **44**. Locking holes **43**A and **44**A are formed on an upper surface of the right accommodation chamber **43** and the left accommodation chamber **44** respectively. The first housing **10** can be connected to the right

accommodation chamber **43**, and can be locked therein by releasably engaging the lock arm **13** in the locking hole **43**A. Similarly the second housing **20** can be connected to the left accommodation chamber **44**, and can be locked therein by releasably engaging the lock arm **23** in the locking hole **44**A. A locking hole **46**A is formed on an upper surface of the power-source side connector connection portion **46**. The power-source side housing **30** can be connected to the power-source side connector connection portion **46**, and can be locked therein by releasably engaging the lock arm **33** in the locking hole **46**A.

A slit-shaped installing cavity **48** is formed at a side of the separation wall **47** corresponding to the power-source side connector connection portion **46**, and a joint terminal **50** is pressed therein. Tab insertion holes **49** are formed in the separation wall **47** and provide communication between each installing cavity **48** and the electric part-side connector connection portion **42** (see FIG. **9**).

The joint terminals **50** are formed by press-molding a conductive plate material. Each joint terminal **50** has a base **51** and a plurality of tabs **52** that project from both sides of the base **51** (see FIG. **7**). Each base **51** is dimensioned to be inserted into the corresponding installing cavity **48**. When the joint terminal **50** has been inserted into the corresponding installing cavity **48**, the tabs **52** project into the electric part-side connector connection portion **42** and the power-source side connector connection portion **46**.

FIG. **8** illustrates wide tabs **52**A and narrow tabs **52**B. The widths of the respective tabs **52**A and **52**B are selected in correspondence to the magnitude of a current capacity.

The joint terminals **50** are disposed in upper and lower stages of the separation wall **47**, as shown in FIGS. **7** and **8**. FIG. **7** shows a plurality of joint terminals **50**A–**50**E arranged widthwise at the upper stage of the relay housing **41**. FIG. **8** shows a plurality of joint terminals **50**F–**50**J arranged widthwise at the lower stage of the relay housing **41**. The upper-stage joint terminals **50**A–**50**E and the lower-stage joint terminals **50**F–**50**J are not connected to each other.

The joint terminals **50** are installed in the relay housing **41** in a direction from the power-source side connector connection portion **46**, with the joint terminal **50** striding over the partitioning wall **45**. More specifically, in the first embodiment, the joint terminal **50**C at the upper-stage side and the joint terminal **50**H at the lower-stage side are installed in the relay housing **41**, with the joint terminals **50**C and **50**H striding over the partitioning wall **45**. That is, each of the joint terminals **50**C and **50**H have tabs **52** that project into the right accommodation chamber **43** and other tabs **52** that project into the left accommodation chamber **44**. The partitioning wall **45** partitions the tabs **52** in the different accommodation chambers **43** and **44** from each other. Accordingly, the tabs **52** in the left accommodation chamber **43** can be connected to terminal fittings of the first housing **10** and the tabs **52** in the right accommodation chamber **44** can be connected to terminal fittings of the second housing **20**. Therefore it is possible to accomplish a branch connection of the first and second housings **10** and **20** adjacent to each other, with the partitioning wall **45** interposed between the first and second housings **10** and **20**.

The fundamental construction of the first housing **10** and the second housing **20** is the same except for the size, number of cavities and the like. Therefore, the construction of only the first housing **10** is described below. However, parts of the second housing **20** that are the same as those of the first housing **10** are designated by the reference numerals used for the first housing **10**. In the following description, the side at which the first housing **10** and the second housing **20** fit on the power-source side housing **30** is referred to as the front side.

As shown in FIGS. **1**, **10**, and **11**, the first housing **10** has a substantially solid rectangular shape. Cavities **11** are formed in upper and lower stages in correspondence to the joint terminals **50**, and are configured for insertion of terminal fittings (not shown). As described above, the tabs **52** are divided into two groups **52**A and **52**B whose widths are different from each other. Accordingly, the cavities **11** are divided into two groups **11**A and **11**B whose sizes are different from each other in correspondence to the tabs **52**A and **52**B.

A cavity **12** is formed longitudinally between the cavities **11**B of the upper stage, and the locking arm **13** is cantilevered at the center of the cavity **12** in its widthwise direction. The first housing **10** is installed in the right accommodation chamber **43** of the relay housing **41** so that the locking arm **13** is locked with the locking hole **43**A of the right accommodation chamber **43**, and the tab **52** of each joint terminal **50** is connected to the terminal fitting mounted in the first housing **10**.

Similarly to the locking arm **23** of the second housing **20** is locked with the locking hole **44**A of the left accommodation chamber **44**.

The construction of the power-source side housing **30** is substantially the same as that of the first housing **10**. Thus, parts of the power-source side housing **30** that are the same as those of the first housing **10** are designated by the reference numerals used for the first housing **10**, and description thereof is omitted herein. Only the elements of the power-source side housing **30** that are different from those of the first housing **10** are described below.

As shown in FIG. **1**, the power-source side housing **30** is a single member installed on the power-source side connector connection portion **46** of the joint connector **40**. One first housing **10** and one second housing **20** are installed on the electric part-side connector connection portion **42**. Thus, the first and second housings **10**, **20** share the power-source side housing **30**.

Similarly to the locking arm **13** of the first housing **10**, the locking arm **33** on the power-source side housing **30** is locked to the locking hole **46**A of the power-source side connector connection portion **46**.

As described above, the power-source side housing **30** is connected to the power-source side connector connection portion **46** of the relay housing **41**, and is connected to the first housing **10** and the second housing **20** through the joint terminal **50**. That is, a harness from the power source is relayed with the joint connector **40** and branches off to harnesses connected to electric parts. The first housing **10** and the second housing **20** share the power-source side housing **30** and the joint connector **40**. Therefore in relaying a plurality of systems, it is possible to make the number of component parts smaller than the conventional art in which the electric part connector and the power-source side connector fit on each other in a one-to-one relationship. More specifically, six component parts are conventionally required to relay harnesses of two systems, whereas in the illustrated embodiment, only four component parts are required to do so.

As described previously, the joint terminal **50** is installed on the relay housing **41** in a direction from the power-source side connector connection portion **46**. Thus, the joint terminal **50** is mounted on the previously molded relay housing **41**

so that the joint terminal **50** strides over the partitioning wall **45**. Therefore it is possible to accomplish a branch connection of the first and second housings **10** and **20** adjacent to each other, with the partitioning wall **45** interposed between the first and second housings **10** and **20**.

The present invention is not limited to the embodiment described above with reference to the drawings. For example, the following embodiments are included in the technical scope of the present invention. Further, various modifications can be made without departing from the spirit and scope of the present invention.

In the first embodiment, the harnesses for transmitting an electric power are relayed. In addition, harnesses for transmitting a control signal may be relayed.

In the first embodiment, one power-source side housing is mounted on the power-source side connector connection portion of the relay housing, and the first and second housings are mounted on the electric part-side connector connection portion. However the number of the housings mounted on each connection portion is not limited to a specific number, but any one of the housings should be shared by other housings.

What is claimed is:

1. A joint connector, comprising:

a relay housing molded unitarily from an insulating resin and having open first and second ends, a separation wall spaced from the first and second ends, such that a first chamber is defined between the separation wall and the first end, a partitioning wall extending from the separation wall towards the second end and defining right and left chambers between the separation wall and the second end, at least a first installing cavity being formed in the separation wall, the first installing cavity being open into and facing into the first chamber, at least one right tab insertion hole extending from the installing cavity to the right chamber and at least one left tab insertion hole extending from the installing cavity to the left chamber; and

at least a first joint terminal having a base press fit into the installing cavity, first tabs extending from the base out of the installing cavity and into the first chamber, at least one right tab extending from the base through said right tab insertion hole and into the right chamber and at least one left tab extending from the base, through said left tab insertion hole and into the left chamber, such that right and left connectors inserted into the right and left chambers can share power from a connector inserted into the first chamber.

2. The joint connector of claim **1**, wherein the joint terminal is formed unitarily from a metallic material.

3. The joint connector of claim **1**, further comprising at least a second joint terminal.

4. A joint connector, comprising:

a relay housing molded unitarily from an insulating resin having first and second ends, a separation wall spaced from the first and second ends, a power-side connection portion extending into the first end and extending to the separation wall, an electric part-side connection portion extending into the second end and extending to the separation wall, a partitioning wall formed in the electric part-side connection portion and orthogonal to the second end for defining right and left chambers in the electric part-side connection portion, a plurality of installing cavities being formed in and opened into the power-side connecting portion, tab insertion holes extending from the installing cavities to the electric part-side connection portion, at least one of said installing cavities having tab insertion holes extending to both the right chamber and the left chamber of the electric part-side connection portion; and

a plurality of joint terminals, each said joint terminal having a base force fit into one of said installing cavities, at least one power-side tab extending from the base into the power-side connecting portion, and at least one electric part-side tab extending from the base through one of said tab insertion holes and into the electric part-side connection portion, at least one of said joint terminals having at least one electric part-side tab extending into the right chamber and at least one electric part-side tab extending into the left chamber, such that right and left part-side connectors inserted into the right and left chambers share power from a power-side connector inserted into the power-side connection portion.

5. The joint connector of claim **4**, wherein the joint terminals each are formed unitarily from a metallic material.

* * * * *